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Interrogating participatory catchment organisations: cases from Canada, New Zealand, Scotland and the Scottish–English Borderlands

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Catchment management in the developed world is undergoing a fundamental reconfiguration in which top-down governance is being challenged by local organisations promoting collaborative decisionmaking. Local, participation-based organisations are emerging as mediators of relations between governments and publics. These organisations, defined here as participatory catchment organisations (PCOs), are emergent at a time when developed world catchment management is itself undergoing substantial change. Through in-depth engagement with four PCOs, and using six case studies, we identify the principles associated with successful problem resolution. The findings illustrate the importance of PCOs as two-way bridges between publics and governments. We identify three principles shared by these organisations that show how, through participatory approaches founded on trust, complicated problems can be resolved in ways that do not unduly punish groups or individuals. In conclusion, we identify four questions that highlight the need to consider the practicality of evolving relations amongst governments, publics, and the organisations that have come to mediate catchment management.

KEY WORDS: catchment management, water, NGO, participation, problem, collaboration

Introduction: the changing nature of developed world catchment management

Catchment management in the developed world is undergoing fundamental change (Gooch 2005; Shrubsole 2007; du Toit and Pollard 2008; Fenemor *et al*. 2011b; Lane *et al*. 2011a; Cook and Spray 2012). In response to dissatisfaction with present forms of governance, new relations are being trialled and new actors emerging. In general, top-down, centralised and expert-led governance is being challenged by bottom-up, local management informed by a diverse range of knowledges (Oliver 2001; Mustafa 2002; Eden *et al*. 2006; Irwin 2006; Reed 2008; Fenemor *et al*. 2011a; Tseng and Penning-Rowsell 2012). Whether rationalised as a means to devolve costs or as a way to empower local individuals, there appears to be consensus concerning ideal catchment management (i.e. toward local, collaborative approaches), but research exploring how this objective might be practiced remains abstract and generalised (for example, see Marshall *et al*. 2010). Broadly, analyses of these trends have been predominantly deductive in nature, testing pre-existing theory and hypotheses against changing governance. Furthermore, there has to date been only tentative engagement with the individuals and organisations who have come to shape catchment management. To complement existing research, we have conducted a more inductive analysis, using as our entry point a group of organisations – from similar yet international contexts – that have become integrated into catchment management due to histories of successful engagement with local problems.

In addition to discontent with top-down governance, the recent global economic downturn has inhibited traditional, capital-intensive governance through a reduction and/or reallocation of capital (Harvey 2010), which is acutely relevant to traditional forms of catchment management. Austerity aligns with pre-existing criticisms of technical management (Werritty 2006; Lane *et al*. 2011b), providing an economic rationale for individuals promoting alternative forms of catchment management. Of particular importance is the emergence of a 'governance gap', which has arisen as national governments disengage from management with the expectation that the public will assume responsibility for delivering the services that citizens have grown to expect. In this context, the number of 'third sector', 'non-governmental' and 'voluntary' organisations has, for some time, been increasing (Yearley 1996; Jepson 2005; Eden *et al*. 2006; Marshall *et al*. 2010; Cook *et al*. 2012). This situation is unsettling because governments appear to have retained the desire to determine policy while devolving costs and responsibility for implementation. As local organisations continue to fill the gap between publics and governments, then, questions arise concerning their obligations, policies and agendas.

To learn from the organisations filling the governance gap, this analysis draws upon in-depth engagements with organisations from Canada, New Zealand, Scotland and the Scottish–English Borderlands. In addition to a long-term engagement with four organisations, for this discussion we have elicited six case studies, each an unaltered description of successful problem resolution from those mediating publics–governments interactions. In addition to identifying a distinct subset of non-governmental organisations (NGOs), we argue that these cases show three, entwined principles: to develop trust as an intermediary between publics and governments; to encourage collaborative decisionmaking by including all vested parties; and to challenge the presumed need for losers by seeking win–wins. Rather than stating the obvious, the cases show how the organisations put these principles into practice. We begin this paper with a discussion of our methodology, before exploring the case studies (see Table 1). We then present results, which have been condensed in Table 2. In the discussion, we explore the three principles before concluding with four questions concerning what is, we argue, an ongoing reconceptualisation of the publics–governments interface in the context of developed world catchment management. In terms of wider relevance, we believe that the growing number of organisations that fit the participatory catchment organisation (PCO) definition (see generally Marshall *et al*. 2010; Cook *et al*. 2012) suggests a need to better understand their activities, particularly how they interpret success. Most importantly, if these organisations continue to mediate public–government relations, then there is a significant but underexplored redistribution of power underway.

Methodology: catchment management organisations and representatives

This research explores successful catchment management by enabling those dealing with problems to identify what is important (knowledge exchange one), and to then relate those issues to the wider discourse (knowledge exchange two). The case studies allow for contrast and comparison across international contexts while simultaneously linking these organisations to the wider emergence of non-governmental actors (Reed 2008; Marshall *et al*. 2010; Allen *et al*. 2011; Cook *et al*. 2012; Penning-Rowsell and Pardoe 2012). The ascendency of local, collaborative decisionmaking demands consideration of actors' experiences. Members of the catchment organisations have provided the case studies in response to a request for 'an example of your organisation's successes'. This reflexive view addresses a desire from amongst these organisations to share their experiences with individuals looking to become involved in catchment management. We have included the case studies in an unaltered form, with only minor typographic changes

Table 1 Physical and social characteristics of case studies

	Physical characteristics of catchment			Social characteristics of catchment	
	Size	Topography	Climate	Urban-rural	Economy and water
River Dee Catchment Partnership	2100 km^2 The main stem of the river is 126 km, with 17 major tributaries	The catchment consists of two geographically distinct regions: the Western half of the catchment is predominantly upland while the Eastern half is lowland. 60% of the catchment is over 300 m in altitude	Annual average precipitation ranges from 2100 mm in the Cairngorms to 810 mm at Aberdeen The region has a cool temperate climate with an annual mean temperature of 8°C	The majority of the catchment's human population are concentrated in the city of Aberdeen	Water is used to supply urban centres and to support light industry and agriculture
Fraser Basin Council	240 000 km^2 The main stem of the river is 1399 km, with 40 major tributaries	The catchment consists of 13 main watersheds, spanning from the Rocky Mountains to the Pacific Ocean It includes five climatic zones, including alpine tundra, grasslands, temperate rain forest, and lowland valley	The climate of the Fraser Basin is highly variable both spatially and seasonally. Average annual temperature is 4°C in the upper watershed (Prince George) and 10°C at the mouth of the river (Vancouver) Average annual precipitation is 279 mm in the central watershed (Kamloops) and 1200 mm in Vancouver	The majority of the catchment's human inhabitants (2.3 million of 3 million) are concentrated in the region of Metro Vancouver	The Basin contributes to 80% of the provincial economy, including 21 million ha of forest, half of the province's agricultural land, eight major mines accounting for 60% of the province's production Approximately 67% of tourism revenue comes from the catchment
Motueka Landcare (New Zealand Fish & Game)	2200 km^2 The main stem of the river is 110 km, with 17 major tributaries	Flat alluvial plains at sea-level with young, relatively fertile soils Rolling and steep hill country in lower basin with low-fertility soils Flat alluvial terraces in upper basin valleys with young relatively fertile soils Rugged mountainous terrain in headwaters, ranging from thin-infertile to thick fertile	The climate is cool and humid with distinct wet and a dry (austral summer) seasons Average annual precipitation ranges from 1000 mm in the east to more than 4000 mm in the western headwaters	The catchment population of 12 000 equals less than 1 person per km^2 with the biggest town being Motueka, on the coast	The Motueka River supports an internationally renowned brown trout fishery and tourism Nationally significant scallop and cockle fisheries in Tasman Bay complement rapidly expanding mussel aquaculture Horticultural irrigation of hops, apples, kiwifruit and berries
Tweed Forum	5000 km^2 The main stem of the river is 156 km, with 11 major tributaries	Bounded to the North and West by the Lammermoor and Moorfoot Hills, to the South by part of Northumberland National Park These upland areas are dominated by sheep farming and forestry and characterised by bare, rounded hills with steep valleys or cleuchs The lower reaches flow through productive arable land	Cool temperate climate High rainfall in the Western headwaters Many of the Eastern tributaries often suffer from low flows in the summer	The Tweed catchment is predominantly rural, ~150 000 people The largest towns are Berwick upon Tweed, Galashiels (12 000) and Hawick (13 000)	The Salmon fishing on Tweed contributes around £18 million per year to the local economy and supports over 500 jobs Combined with the stunning scenery and the rich built and cultural heritage, tourism is one of the mainstays of the region's economy

Table 2 Characteristics of catchment organisations

	Origins	Mandate/approach	Funding	Relationship with government	Challenges
Dee Partnership	Dee Catchment Management Plan arose due to desire of land management stakeholders to 'get ahead' of upcoming environmental regulations Steering Group formed in 2003	To promote, support, and undertake fully integrated management and planning in the River Dee catchment Using strategic planning, project delivery and awareness raising, we are working to protect, enhance and restore the waters of the River Dee catchment	DCP core funding comes from seven statutory and non-statutory organisations In kind support from all partner organisations through staff representation on steering, management and project groups In kind support in form of specific skills, data and advice provided as required.	The Scottish Government Rural Payments and Inspections Directorate on Steering Group Has no statute, but works closely with the Scottish Government, and its agencies Mediator between government agencies and water managers	Agricultural and urban pollution and morphological alterations Growing population pressures and demand for housing Habitat protection for protected species Supporting organisational stability by maintaining funding security
Fraser Basin Council	Became a not-for-profit NGO in 1997. The predecessor organization, the Fraser Basin Management Board, was a quasi-NGO, which existed from 1992 to 1997	To ensure that decisionmaking will protect and advance its future social, economic and environmental sustainability To bring together government, private sector, and non-government partners to find enduring, workable solutions to many complex sustainability challenges Take advantage of opportunities to enhance the sustainability of the Basin In some cases resolve entrenched conflicts	Most of the Fraser Basin Council's funding is project based. Funds are received from government, non-government and private sector organizations to support the Council in the delivery of sustainability programs, projects and initiatives in partnership with others Funding is also received from regional districts located within the Fraser Basin	Federal, provincial, municipal, and First Nations governments are all represented on the Council's Board of Directors There is also diverse government involvement in the various programs, projects and initiatives of the Council	Growing population pressure, with a 20-year projected population of approximately 4 million Urbanisation Competition for resources Disputes between users: industry, environmental, and local interests Pacific Salmon habitat protection Climate change impacts
Motueka Landcare (New Zealand Fish & Game)	An 11-year ICM research programme run as a national demonstration project 2000–2011 Prompted by 60% decline in brown trout, legal battles over offshore aquaculture perceived sedimentation from forestry, and pressures on river–coastal system	To conduct multi-disciplinary, multi-stakeholder research to provide information and knowledge that will improve the management of land, freshwater, and near-coastal environments in catchments with multiple, interacting, and potentially conflicting land uses The goal is an innovative combination of historical research, biophysical experimentation, simulation modelling, and social learning	Funded through national research grants and co-funding from Tasman District Council, farm and aquaculture groups, Ministry of Agriculture and Forestry, Maori and local groups Ongoing support provided by Tasman District Council, through the NZ Landcare Trust, research and stakeholder groups	A national case study to learn about good practice ICM, including collaborative, devolved and integrated governance of land, water and coasts A founding UNESCO-HELP 'world demonstration' catchment	Maintaining brown trout fishery impacted by land use intensification, forest harvesting and flooding Water for irrigation is reaching allocation limits in Motueka and adjacent Waimea catchments. Maintaining social capital to manage the catchment-coastal system holistically.
Tweed Forum	Started in 1991 as an informal liaison group, Tweed Forum initially began due to unregulated river engineering activity which galvanised the main stakeholders to coordinate on a set of rules	To promote the sustainable use of the whole of the Tweed catchment through holistic and integrated management and planning. Work at both the strategic level and the project level in order to achieve tangible benefits To identify the collective issues, priorities, and potential solutions for river works, water quality, tourism and recreation, flood management, water resources, and habitats and species conservation	Tweed Forum is a registered non-profit making company limited by guarantee (No SC 191466) with charitable status (No. SC030423) It derives funding from its members and a variety of statutory, voluntary and structural funding sources	Has no statute, but works closely with the Scottish Government, its agencies and English counterparts It provides an honest-broker role between the government agencies and those owning, managing and working on the land	Habitat loss due to agricultural intensification (i.e. overgrazing); Flood management; Diffuse pollution; Conflicting land use; Coping with ever-increasing regulation; Realising multiple benefits; Keeping the organisation solvent.

for consistency and space. Overall, the case studies provide an opportunity to consider the potential themes running through participatory catchment management, as perceived by these actors.

The organisations

The respondents are members of four organisations from three developed world, Anglophone and temperate regions: the River Dee Catchment Partnership (Scotland), the Fraser Basin Council (FBC; west coast of Canada), the Motueka Integrated Catchment Management Group (New Zealand), and Tweed Forum (Scottish–English Borderlands). While we have chosen to contrast the experiences of individuals and organisations from similar contexts, we recognise that catchments, populations, cultures, economies and histories differ and produce heterogeneous examples. Despite differences, our desire to contribute experiential and empirical findings necessitates a degree of generalisation across these locations. We argue that, in terms of real world examples, these cases describe similar organisations dealing with similar problems in similar contexts; ideally, then, the findings will have relevance outside these individual cases (Yin 2003). In terms of their make-up, the organisations draw together a diverse range of participants. For example, the Sherry River Catchment Group includes all of the farming families of a subcatchment of the Motueka River; the group has been supported by the Landcare Trust and therefore has been able to apply for community funding through central government's Sustainable Farming Fund. Alternatively, the FBC's board is made up of 38 directors, including federal, provincial, local and First Nations representatives. In addition, the private sector and civil society are represented. The primary motivation is thought to be the advancement of sustainability in the Fraser Basin. Other motivations include supporting dialogue and sharing perspectives at a safe table, as well as opportunities to strengthen bilateral relations with other members. For Tweed Forum, participation is, similarly, motivated for a variety of reasons, which include the desire to share knowledge and resources; achieve efficiencies (in time and money); work in a smarter, joined up way; and perhaps, most importantly, to bring about meaningful changes on the ground that help meet their own strategic objectives.

The organisations were chosen as a result of prior engagement with the FBC and Tweed Forum, which are involved in numerous research projects exploring physical and social aspects of catchment management. Tweed Forum's nationally recognised successes, and the Scottish Government's interest in replicating the organisation's operations and governance structure, led to discussions concerning 'what makes Tweed Forum successful', which in turn led us to seek additional, international examples of similar organisations successfully addressing catchment management challenges. Given Tweed Forum's networks, the other organisations were analysed, then contacted.

The organisations, which range from formal to a notional group of interested parties with a common purpose, share many traits (see Table 1), but none more significant than the desire to encourage collaborative decisionmaking based on negotiation amongst all parties active within catchments. This is, in effect, how the organisations interpret 'success' and reflects how they develop policy and engage with local problems. While each of the four catchments is unique, and while the physical and social characteristics vary, the problems shaping each organisation appear to be highly alike. A critical similarity amongst these organisations is their interpretation of success. For example, the Tweed Forum interprets success as:

> working in partnership to achieve integrated catchment management with an emphasis on achieving changes on the ground that deliver multiple benefits.
>
> Executive 1 (22 June 2012)

Similarly, a program manager from the FBC:

> interprets success in terms of advancing and improving the status of sustainability on the ground (i.e. improved water quality, healthier fish stocks, resolution of specific conflicts). In some cases we also interpret success in terms of good process (i.e. meaningful engagement with communities, stakeholders, and First Nations; decision making that is informed by science and other forms of knowledge; collaboration; etc.). Ideally, we would look for correlations between good processes and successful outcomes on the ground.
>
> Program Manager 1 (13 July 2012)

Finally, an executive from the Motueka Landcare group lists several traits that echo the previous comments:

- the whole catchment community recognises their land and water management affects everyone else;
- a strong knowledge base created for catchment planning for decades to come;
- recognition that catchments extend offshore;
- stakeholders now committed to working together because the Motueka is a special place (Executive 2, 2 July 2012).

Overall, the organisations share an understanding of success based on local partnership, conflict resolution, trade-offs, and positive change; their overarching aim, too, is linked to sustainability and equality amongst diverse users.

The participants

Dialogue with and between these organisations began in September 2010, leading to a weeklong

knowledge exchange in May 2011 and a follow-on meeting in October 2011. The knowledge exchanges provided an unusual opportunity for these organisations, as they were said to rarely have the time to consider their role(s) within wider governance or to spend extended periods developing ideas and/or networks. The connection of national networks, in particular, has enabled further knowledge transfer. The two exchanges were divided into exploratory and assessment phases, with the former providing an opportunity to compare and contrast experiences, challenges and systems of management and the latter providing the opportunity to discuss questions arising from that exchange and to critique the findings. In addition, this process and subsequent communication included engagement with three types of representatives: an executive, a programme officer, and an individual responsible for public engagement – in one case a single individual was responsible for both programme management and public engagement. The inclusion of three 'layers' is original and is integral to understanding the scales at which these organisations operate. The exchanges were conceived and organised collaboratively, with participants responsible for ensuring the topics, themes and questions were relevant to their operations. This was accomplished using email, in which the organisers elicited suggestions, which were then presented to the group for comment and amendment.

Case studies: examples of successful, participatory catchment management

Dee Partnership: Beginning a collaborative venture (northeast Scotland)

The Tarland Catchment in northeast Scotland supports a wide range of land uses. Pressures from agriculture and from housing development influence management. As a result, water quality, aquatic and riparian habitat in the catchment are degraded, prompting concerns regarding suspended sediments, phosphorus, nitrates, coliforms and poor instream habitats.

The ongoing Tarland Catchment Initiative (TCI) began in 2007 as a local project, supporting sustainable solutions and integrated approaches to land management. The project has three aims: to improve awareness of issues relating to local water quality; to implement stream improvements to alter practices detrimental to water quality or habitat; and to assess the efficiency and benefits of such actions.

The TCI, part of the Dee Catchment Management Plan, is being taken forward by the James Hutton Institute, which is a government-financed research organisation, working in close association with various government agencies and the main landowner, the MacRobert Trust. The TCI has:

1. Installed a wetland to improve treatment of water released by the local sewage works, improving water quality and providing habitat for wading birds.
2. Monitored diffuse pollution, exploring how it might be reduced.
3. Installed buffer strips, reducing diffuse pollution from agricultural fields and reducing soil erosion and faecal contamination associated with cattle. The buffer strips have also provided bankside habitat.
4. Established small wetlands to provide a variety of habitat, improving water quality and flood management.
5. Trialled different types of watering for cattle, providing an alternative to highly pollutive in-stream practices.
6. Worked with community members, farmers, and schools, raising awareness of diffuse pollution.

Both the community and individual stakeholder groups have benefited from the TCI. As well as the intended improvements in environmental quality and landscape enhancement, the community has taken ownership of the buffer strips, creating a network of footpaths which are maintained and promoted as local recreational venues. The community has also initiated the installation of a small pond to reduce local flooding, and erected a hide for wildlife viewing. In terms of benefits, the agencies responsible for water quality and biodiversity achieved substantial improvements, including Scottish Water, who benefited from secondary treatment of its wastewater. The catchment's fisheries also benefited, contributing to an unexpectedly quick return of salmon to watercourses from which they had been absent for many decades. The catchment's land managers won grants for improvement measures, benefited from improved on-farm facilities, achieved compliance with regulation, and added to their understanding of the water environment, including access to a live website showing stream conditions. The scientists involved in the TCI strengthened their understanding of the socio-natural environment and initiated a long-term research platform. Finally, the wider Dee Catchment Management Plan (Cooksley 2007) will continue to benefit from knowledge gained from the demonstration sites.

The FBC: Using collaborative and integrated approaches to manage invasive plants (British Columbia, Canada)

The FBC has facilitated participatory, collaborative processes and initiatives throughout the Fraser River Basin in British Columbia (BC), Canada for about 15 years. In 2001 the FBC Board of Directors decided to tackle the 'thorny' issue of invasive plants. This was a

pressing sustainability concern, with social, economic and ecological consequences.

Invasive plants have a significant impact on the region's environment and economy. They replace native species and decrease biodiversity. On BC's agricultural lands, they reduce crop yields by an average of 10–15%. A 2005 study showed that spotted and diffuse knapweed (*Centaurea maculosa* and *Centaurea diffusa)* could reduce cattle forage by up to 90%. The calculated cost to ranchers of this one species was $400 000 per year, a loss that could exceed $13 million per year should knapweed spread to the limits of its range. The introduction and spread of invasive plants happens on multiple fronts, such as travel and trade; horticulture and gardening; transportation and utility corridors; seed mixtures; recreation; and through the passage of livestock, wildlife, people and pets.

In 2002, the FBC hosted a meeting of federal, provincial, local and First Nations government representatives, along with those from NGOs and industry. Their collective efforts led to an Invasive Plant Strategy for BC (FBC 2003), featuring an action plan to address invasive plant populations throughout the province.

The FBC recognised early that a long-term commitment to collaborative efforts would be required to tackle the challenge. In 2005 the Invasive Plant Council (IPC) of British Columbia was created as a registered non-profit society to advance the implementation of the Invasive Plant Strategy. The IPC is an independent body with a consensus-based board representing various sectors and regions, modelled closely on the FBC's governance structure. The IPC Board and broader membership include representatives from all orders of government, NGOs, land and water-based user groups, resource-based businesses, and industries and utilities.

The IPC works to minimise the negative ecological, social and economic impacts caused by the introduction, establishment and spread of invasive plants. It does this by increasing public awareness; securing long-term, stable funding for invasive plant management; reviewing current legislation on invasive species to find areas needing attention; building linkages among current invasive plant inventories and databases; and identifying and promoting coordinated research on invasive plant management.

There was an important early role for the FBC to serve as a catalyst for action on the issue of invasive plants. The FBC facilitated the development of a provincial invasive plants strategy and a memorandum of support designed to encourage people in different regions and sectors to become active in their own fields and to work collaboratively.

The IPC now has a large (and growing) circle of members. They include technical specialists working for government and industry, weed committee coordinators, First Nations representatives, foresters, forest technologists, biologists, ranchers, horticulturists, recreation enthusiasts, gardeners and other concerned individuals. Over 1000 individuals and 300 organisations have signed the IPC memorandum of support and joined the effort. In its first 5 years, the IPC has helped to establish and support local invasive plant committees across BC. The IPC has become a key resource organisation on invasive plants for all those working 'on the ground' in multiple sectors and jurisdictions, offering information and resources tailored for different audiences (from local government decisionmakers to forestry workers, landscapers and home gardeners). Taking a fresh collaborative approach may be daunting, but it is an investment that brings out the best in people and leads to the multiplication of long-term benefits.

Motueka ICM Group: Water Augmentation Committee (Waimea, New Zealand)

The 722 km^2 Waimea River catchment lies west of Richmond and Nelson City, New Zealand. The Waimea plains support a diverse range of intensive horticulture and cropping. Some pastoral farming and plantation forestry occurs in the hill country and native forest in the river headwaters. The river is locally valued as a recreational resource for swimming, fishing, jet boating and kayaking and provides habitat for fish and birds. Some 3700 ha of the plains are irrigated, mostly from shallow groundwater. However, the groundwater pumping induces the Waimea River to periodically run dry, failing its target minimum flow of 225 l/s on the plains despite a natural annual low flow above the plains of 2200 l/s. The security of supply for irrigators is correspondingly low, with water use restrictions required in seven of the last nine years, yet insufficient to keep the flow consistently above the 225 l/s target. A further 1500 ha of the plains could be irrigated if water was available, as well as providing for future urban and industrial use.

Rather than litigate, risking even more restrictions on water use, the parties dependant on the river agreed in 2003 to seek a collective solution. A committee representing all stakeholders has since investigated water storage options with the aim of providing both an adequate flow for the ecological health of the river and to meet all present and future abstractive needs on a hundred year horizon. A variety of tasks have been undertaken, including:

- assessment of environmental, cultural, and out-of-stream flow and water quality requirements;
- over 20 dam sites and out-of-catchment water augmentation options considered;
- likely land uses, urban growth and water requirements assessed;
- groundwater and flow regime models updated and water quality modelling undertaken; and
- costing and governance options debated.

Funding for these tasks has come from a partnership, including central and local governments, irrigators and environmental interests. A dam in an upper tributary to augment natural river flows during dry periods is the most likely outcome, funded from these same sources. This dam is in the final stage of planning. The committee is an independent group of the affected parties, supported by the local authority as project manager.

The project has now been recognised as a leading example in New Zealand of collaboration between initially competing parties. In particular, a recent review of the project has found that the 'community nature' of the scheme is more likely to resolve difficult issues such as land acquisition. Communication with and frequent surveys of various parts of the community have been key features to ensure community 'buy-in' to the project.

Motueka ICM Group: Supporting voluntary action to restore water quality for swimming (Sherry River, New Zealand)

New Zealand farmers produce milk, meat, wool, timber and related products with minimal government support for environmental protection. This case study explored the factors that can motivate voluntary action by catchment landowners to improve water quality. It is part of a wider research programme on integrated catchment management (ICM) carried out in the 2170 km^2 Motueka catchment.

Early in the ICM research programme, a two-year study of water quality across the Motueka catchment and its tributaries (Davies-Colley *et al*. 2004) showed that the 78 km^2 Sherry River subcatchment had high levels of bacterial contamination, indicating the river was unsafe for swimming in its lower reaches.

The water quality results were discussed with a Community Reference Group, which was set up as a sounding board for the ICM project. They passed this new knowledge through their community networks, which became concerned that farming was being blamed. The NZ Landcare Trust, an organisation working at the interface between farmers and government, responded by convening a 'kitchen meeting' of researchers and the eight major landowners in the catchment to discuss the water quality results – especially as they and their families enjoyed swimming in the river.

It was the combination of science and facilitation of dialogue that galvanised the farmers into action. What was causing the problem and what could be done to fix it? They formed the Sherry River Catchment Group and asked the researchers to get to the cause of the problem. In a collaborative exercise with a local dairy farmer, researchers monitored changes in water quality as the herd crossed the stream. *Escherichia coli* levels reached up to 50 000 cfu/100 ml in the Sherry when 246 cows crossed the river, effectively quadrupling the daily load of faecal bacteria in the river (Davies-Colley *et al*. 2004). The herd crossing also elevated suspended solids and total nitrogen. The work showed cows were 50 times more likely to defecate in water than elsewhere on the raceway.

Importantly, the farmers accepted the results as they had asked the questions. In response, over a two-year period, four stock-crossing bridges have been funded and built by farmers, replacing all former river fords. The installation of bridges has been facilitated through the NZ Landcare Trust and supported by the Tasman District Council through the waiver of the normal fees for building consent. At a cost per bridge of up to NZ $50 000, the farmers have made this investment not simply because of the environmental benefits, but because there are also benefits for stock health, faster access to milking, ability to cross during floods, and because industry-led regulations were likely to require this action in future. The use of bridges has resulted in about a 50% reduction in bacterial concentrations in the river.

Perhaps most importantly, the collaborative community approach has created cohesion among the Sherry landowners, researchers and agencies. The scientists have also identified that other changes in farm management will be needed to routinely meet later swimming quality standards in the Sherry River. Landowners are determined to bring river water quality up to swimming standards through bridging, culverting, riparian management, and improved environmental planning involving all land use types. They are now implementing a programme of priority actions identified in their individual Landowner Environmental Plans. When asked what factors would contribute to their continued implementation of those priority actions, a common theme was that 'having someone show an interest' is vitally important for the long-term success of the catchment group.

Tweed Forum: Clean bathing waters, riparian habitat restoration and happy farmers (the Eye Water, Berwickshire)

From its source in the eastern Lammermuir hills of southeast Scotland, the Eye Water has a catchment area of 120 km^2 and runs through rough grazing, pasture and arable land, reaching the coast at Eyemouth. Eyemouth beach is designated a Bathing Water under Directive 76/160/EEC and must comply with EU water quality standards.

Rural diffuse pollution affects the Eyemouth bathing water, with the potential to also affect designated bathing waters at Pease Bay and Coldingham Bay. The Eyemouth bathing water failed to meet mandatory standards in 2005 and 2007. Diffuse pollution associated with arable and livestock farming in the Eye Water catchment contributed to this failure and studies of faecal indicator organisms showed that much of the origin was from a ruminant source (i.e.

livestock). The problem was exacerbated by short-grazed and steep pastures, leading to situations in which heavy rains washed sheep droppings directly into the river. In addition, cattle tend to defecate while standing and drinking in the river. The creation of thickly vegetated buffer zones was required.

The Scottish Environment Protection Agency (SEPA) approached Tweed Forum to help enlist farmers to fence-off small streams in the upper catchment, particularly at 'hotspots' where sheep and cattle had unrestricted access to the river for watering purposes. Altering this practice carried significant financial implications, with investment needed in fencing, water pipes, water troughs and water pumps.

Tweed Forum approached 29 farmers identified by SEPA and discussed various options, including support for capital works. Eleven farmers participated, with three farmers being signed up to the Scotland Rural Development Programme with Tweed Forum acting as an agent. Tweed Forum also applied to the SEPA River Restoration Fund for a sum of £45 000 for works carried out on 10 farms. Together with capital from the Scottish Rural Development Programme, the project spent £87 500 on works to protect the quality of water in the Eye Water. The works included six new water troughs, 12.7 km of livestock fencing, the protection of 7800 m of river (11.7 ha in area) and 500 native trees planted. This collaborative approach is typical of Tweed Forum's work in subcatchments of the Tweed River.

This case study shows that with detailed and sensitive facilitation, farmers are able to protect the river, create wildlife habitat, and continue farming without fear of breaching regulations. To date, water quality at Eyemouth Beach has improved, though not without further difficulties and polluted waters.

Tweed Forum: Wind farm and leveraging multiple benefits (Scottish–English Borderlands)

In the Scottish Borderlands, since 2009, funding from wind farm mitigation measures has been used to finance natural flood management adjustments that will benefit downstream communities, particularly to flood prone properties in the town of Galashiels. This has happened with the collaboration of Scottish Borders Council, the developer (Scottish Power Renewables), landowners, tenant farmers and Tweed Forum.

In the UK, wind farm developers must seek consent for works and have to fulfil conditions to gain planning permission. In this case, the developer was obliged to either create suitable habitat to replace that lost during development (dwarf-shrub heath), or to pay a sum to the local council, who would arrange for off-site mitigation.

The Dun Law Windfarm Extension Habitat Mitigation Project was organised, with Tweed Forum responsible for a budget of £36 500 to create an agreed amount of semi-natural habitat within an agreed area and timescale. The preferred area was to be within the 'zone of visual influence' of the wind turbines, which stand around 120 m to their tips, and to influence the upper catchment of the Gala Water, the river which runs through Galashiels and which has a history of flooding commercial and domestic properties.

Tweed Forum approached landowners and farmers to discuss the potential for installing natural flood management measures along watercourses. The measures included planting native riparian woodlands, hillslope woodlands, off-stream temporary flood ponds and water margin protection. All these features include multiple benefits for wildlife, landscape and flood mitigation; if designed well, they can also benefit the farmer.

Benefits to farmers include livestock safety (i.e. preventing sheep and cattle from drowning in steep-sided ditches), livestock health (i.e. keeping livestock apart to prevent disease transfer), and easier livestock handling using well sited fences. Crucially, it was possible to draw upon other revenue streams. Having multiple funding sources allowed the off-site mitigation funds to be used to top-up multiple projects (which are not 100% funded) and to provide facilitation by way of design, form filling, site management and advice. In this way, external funds were levered into the project and, by doing so, far greater semi-natural habitat and flood mitigation measures were created.

Working with five farmers, the project has created 45.49 ha of new native riparian and hillslope woodland on the banks of the upper Gala Water; six off-stream ponds; six floodplain scrapes/seasonal ponds; 1.2 km of fenced-off water margin; and identified and protected 16.8 ha of species-rich grassland. Agri-environment capital payments to farmers were £148 000, with revenue payments of a further £95 000. Thus, for every £1 received through off-site mitigation, at least £6 was levered from additional sources. The benefits of flood reduction, habitat creation, farm resilience and landscape improvement represent a win–win from stakeholder, local and organisational perspectives.

Results: similar organisations, different contexts

We have drawn together these organisations and elicited case studies outlining successful problem resolution with the aim of identifying the traits, presumptions, knowledges and approaches that these organisations associate with success, what has elsewhere been described as a framing (Miller 2000). More simply, we have asked what do similar organisations, from similar contexts, dealing with nearly identical challenges – albeit with contextual differences – have in common? We have identified patterns amongst the organisations and across the cases, suggesting to us the emergence of a distinct subclass of NGO. Partly in response to discussions during the

knowledge exchanges in which participants expressed frustration with the inconsistent and inexact 'NGO' concept, but also recognising similarities in terms of origin, mandate, approach, funding, relations with government, and the challenges being addressed (see Table 2), we describe the emergence of PCOs. We argue that, in addition to responding to wider trends within water resource management (Shrubsole 2007; Johnson and Priest 2008; Fenemor *et al*. 2011b; Lane *et al*. 2011b; Penning-Rowsell and Pardoe 2012), this subdivision and definition confronts the tendency to group and over-generalise NGOs. This responds to what Eden *et al*. (2006) describe as the relative neglect of NGOs within analyses of knowledge production in the context of environmental challenges. The results are summarised in Table 2, and we include a brief outline of the PCO concept before turning to the three shared principles in the ensuing discussion.

The emergence of PCOs

PCOs are more than catchment-bound NGOs. Rather, they represent a subset of NGO with shared characteristics and common framings, possibly as a result of having evolved in the context of similar challenges. Despite governmental, scale, political and economic differences amongst the catchments and organisations (Tables 1 and 2), the PCOs have surprisingly similar histories. Each began in response to local problems and their origins can be traced to dissatisfaction with existing and often disconnected governance relative to local priorities. For example, the Dee Partnership began in response to water quality problems associated with diffuse pollution connected to poorly regulated septic tanks; the FBC as a result of plummeting numbers of Pacific Salmon (*Oncorhynchus tshawytscha*) and poor water quality; the Motueka ICM group, itself a hybrid organisation of activist-researchers, to a host of issues, including river pollution associated with faecal contamination from dairy production; and the Tweed Forum to *ad hoc* river maintenance by farmers removing gravel in response to flood risk. For each organisation, existing governance failed, leading to what can be understood as unsustainable practices at the local scale due to an inability amongst government to address the situation.

In response to local problems, each of the PCOs developed mandates for intervention into land and water management practices. For some, their aims were made explicit through charters and clear objectives, while others have remained less formal, choosing to guide their actions in the context of 'problem solving'. The organisations differ in their access to funding, but despite these differences there is an important common emphasis on entrepreneurial efforts to locate funds from multiple sources, due in part to a shared sense that funding has recently become more scarce. For each organisation, their successes have created a tension between assuming more responsibility for wider catchment challenges against securing the resources needed to operate. As part of this issue, the already complicated relationship with government has become more difficult. Governments are at once: responsible for the poor management that prompted creation of the PCOs, a partner seeking to improve land-water management, and a source of direct and indirect funding. This complicated relationship with a key stakeholder is representative of the challenges that occupy the PCOs (see Table 2), leading to the identification of three shared principles, which form the basis of our discussion.

Discussion: the principles shaping PCO activities

Returning to the growing academic discourse exploring catchment management and alternative forms of water governance, the case studies show that the PCOs – both implicitly and explicitly – use as their foundation three shared, entwined principles: to position themselves between individuals (i.e. local scale) and decisionmakers (i.e. regional and national scales) while being trusted by both sets of actors; to enable discussion amongst all parties in response to specific challenges, as opposed to governmental divisions or academic-based disciplines; and to ensure that, whenever possible, the outcomes of collaborative management of local problems result in 'win–wins'. These principles are not unique to PCOs, but their prevalence suggests a level of similarity that helps to clarify the growing involvement of PCOs within developed world catchment management (Yearley 1996; Eden *et al*. 2006; Marshall *et al*. 2010; Cook *et al*. 2012).

Trust brokers (to overcome conflict and disagreement)

The case studies each describe a similar pattern: a problem is identified, trust is earned, compromises are mediated, and solutions are implemented. The key difference between this process and 'normal' governance (Lane *et al*. 2011b) is that the PCOs each ensure that, as a result of their activities, trust is the primary outcome. For the PCOs, trust is the currency on which further engagement with problems in the catchment are based. Trust may well be the key determinant of PCO success (Irwin 1995). For example, within the Motueka catchment, declining water quality and the inability for locals to swim in the rivers led to the assemblage of interested and vested parties. With a working relationship and trust established, that group initiated an information gathering exercise that allowed for a solution to be identified and implemented. It was trust in this process (Irwin and Michael 2003; Fenemor *et al*. 2011b) that enabled success, just as it was trust that allowed Tweed Forum to successfully distribute wind farm levies or the FBC's questioning of practices in the context of invasive

species. Similarly, in the Waimea River case study, accusations of improper use amongst farmers, foresters and urban users required a trusted party whose findings would not automatically be called into question. In each case study, it is trust in the knowledge and decisionmaking that is the primary outcome.

Trust also allows the PCOs to act as mediators amongst 'opposing' users, for example between Scottish Power Renewables and the Borderlands communities, or between the parties profiting from urban development and those who wish to improve water quality in the Dee catchment. The PCOs are shown to be dependent on their positions at the interface of local and regional/national scales. The PCOs are protective of their positions and view trust as the lifeblood of their operations. For example, the FBC's efforts to generate support for the poorly understood challenge of invasive species shows the need to build collaborative relations (next principle), but to accomplish this requires a trusted party able to ensure ethical mediation and assure stakeholders of a fair process in which their knowledges and interests will be seen as legitimate (Wynne 1996). Trust in the PCOs is also the basis for funding, leading to donors who are willing to pool their resources under transparent circumstances, assuming the ability to accomplish more collectively than individually. This concentration of funds is enabled by trust. Furthermore, their role as central mediators allows the PCOs to identify areas of common interest, which presumably reduces redundancy and frees funds for additional activities.

Collaborative decisionmaking (to deal with problems)

The PCOs that inform this discussion operate through collaborative decisionmaking based on horizontal power sharing, as opposed to hierarchical models common to governments. Underlying this approach, inseparable from the previously mentioned need for trust, is the aim of enabling compromise and building consensus amongst vested parties. A key aspect of these activities is the involvement of stakeholders with, as one respondent explained, some 'skin in the game'; in this way, the PCOs are able to negotiate solutions that ensure widespread acceptance. This approach lends support to a prevailing but poorly substantiated claim (du Toit and Pollard 2008; Reed 2008) that participatory solutions are more likely to last. As a result of this inclusiveness, stakeholder perceptions, anecdotes, values and experiential knowledge/expertise are incorporated into governance. These knowledges do not replace science, and science retains a prominent role within decisionmaking (Yearley 1993; Eden *et al*. 2006), but stakeholder views and opinions are not disregarded on the basis of being non-expert or unscientific.

The PCOs each connect a better understanding of socio-ecological challenges with the facilitation of equitable compromises, but they rarely interpret the public as knowledge deficient or in need of education (Irwin 1995). PCOs regard public knowledge as crucial to decisionmaking and to their approaches. This leads to the identification of common ground, replacing uncertainty and conflict with a basis for compromise (Reed 2008; van Wyk *et al*. 2008; Fish 2011; Polasky *et al*. 2011). For example, Tweed Forum takes the perceptions of farmers as the starting point for efforts to limit diffuse pollution, recognising the farmers' interests (without judgement) rather than attempting to use punishments to demand conformity to policy. This approach is similar to the Sherry River case study, in which farmers knew that the collaborative solution, while costly, would pre-empt potentially more stringent measures by the state if the problem persisted. Overall, this approach results in organisations that have cultivated significant moral authority rooted in their promotion of participation for the public's benefit (Kesby 2007). For example, the FBC's inclusion of federal, provincial, local and First Nations governments on its board of governors, and in their assemblage of disparate groups to engage with the issue of invasive species, are representative examples of the complicated relations that the PCOs navigate in order to be successful. This need for multiple actors with a wide range of interests reflects the ubiquity of water-based problems, with the case studies showing the extent of connections across a hybrid land–water–social system.

Win–wins (lasting governance needs mutual benefit)

Trust runs throughout each of the case studies, most clearly in terms of the aim of facilitating 'win–wins'. As a result of trust, the PCOs show that they can draw diverse parties together to address a problem while delivering multiple benefits. In each of the case studies, the compromises show that most, and often all, of the stakeholders can amicably resolve problems if given the opportunity. The priority on win–wins solidifies the PCOs as trust brokers amongst actors with conflicting agendas (Fenemor *et al*. 2011b; Fish 2011). The centrality of 'win–wins' is a key trait of the PCOs and distinguishes their efforts from the assumption that management must (unfortunately) have losers (see Penning-Rowsell and Pardoe 2012).

In each case study, the PCOs challenge a zero-sum interpretation of environmental governance, placing a shared emphasis on hybrid (Whatmore 2002) environmental–social–economic problems. For example, the water allocation challenge mediated by the Waimea Water Augmentation Committee refuses to prioritise either the natural environment or the economic development that further abstraction could enable. Instead, abstraction is considered as part of the local economy, the natural environment and the social fabric of the area as part of wider analysis of the complicated relations between these

inseparable factors. For each of the PCOs, fisheries also exemplify the inseparability of economic, environmental and social factors. This is not to argue that the 'three' factors always receive equal weighting. Rather, the case studies show that solutions require that decisionmakers take into account impacts outside the immediate issue. The case studies describe efforts to establish balanced trade-offs between nature and society that will not impair the ability of future generations to maintain or improve their quality of life (Repetto 1986). In effect, this approach is a 'win–win' across time, with many of the PCOs working to revitalise and return damaged socio-ecological systems to more sustainable levels. The Dee Partnership's aim to make future urbanisation less detrimental, while helping to improve water quality, is one such example. Overall, the PCOs are shaped by recognition that long-term balance requires that each party benefit from collaborative efforts. The cases show how, through participatory approaches founded on trust, complicated problems can be resolved in ways that do not unduly punish groups or individuals. Instead, participatory catchment management is about informed and directed development that recognises that long-term sustainability is based on mutual benefit and interdependence amongst interested parties.

Conclusion

The emergence of PCOs is part of wider changes to catchment management in the developed world. A host of processes and phenomena are pushing the adoption of a decentralised and participatory form of governance, following nearly a century of centralised, expert-led and technically reliant approaches (Eden *et al*. 2006; Blackstock and Richards 2007; Johnson and Priest 2008; Cook *et al*. 2012). As a result, local and collaborative decisionmaking is becoming more widespread, reflecting consensus amongst those responsible for addressing water-related problems in developed world catchments. This trend suggests that local decisionmaking will continue to proliferate, but *how* it might be practiced remains less clear. To date, examples of local collaborative decisionmaking are said to be scarce, for example, Cook *et al*. (2012, 5) declare 'truly effective local stakeholder engagement is serendipitous, rather than facilitated'. The case studies suggest otherwise. They show that a growing number and variety of organisations are taking the lead in catchment management, driving local agendas through an inclusive approach founded on trust with the aim of mutual gain. This argument, though, is limited to the cases that we studied, which were chosen because of their past successes. There is reason to temper the findings as the representativeness of these cases is unknown and likely unknowable without longitudinal analysis. Alternately, what they do is recognise an emergent trend within catchment management and identify potential avenues for further analysis and comparison (Yin 2003).

The emergence of PCOs is nascent and still evolving, with numerous unanswered questions, four of which we have chosen to highlight. The first involves how governments will react to a redistribution of power to local individuals and organisations? Governments have historically maintained control of catchment management through unequal power and control of funding (Mustafa 2002; Penning-Rowsell and Pardoe 2012). If the ability to control catchment management has been a reflection of economic investment and regulatory authority, what are the implications of the emergence of a local and participatory model? Second, the cumulative impact of local decisionmaking on national policy and interests is an unknown and potentially unknowable factor. National decisionmaking has its strengths. In particular, it is economical in that, once conceived, it can form a relatively consistent, stable foundation. In reviewing and contrasting the case studies, the economic viability of these initiatives requires comparison with centralised, expert-led alternatives. Whether these case studies are scalable remains unknown. Third, the move to decentralise catchment management and to devolve decisionmaking to local parties remains a complicated objective. Does devolution represent a new form of catchment management or a new way to deliver existing catchment management? The issue is whether central governments are willing to share power with local stakeholders, and whether this could lead to potential conflicts over, for example, how disagreements between national and local interests are resolved. This question is particularly important in the context of controversial initiatives, such as the sacrifice of present gains for future sustainability. This question is all the more important during an economic downturn when communities, regions and nations compete for investment and development opportunities (Jackson *et al*. 2012). Fourth, this analysis has indirectly contrasted competing forms of catchment management, one currently dominant and rooted in democratic authority while the other is emergent and rooted in participatory authority. Lacking from the discourse is an appreciation for the entrenchment of ideas and practices. Protocols, rules and history shape the context of catchment management and, outside of resource management, there are examples of dominant framings appropriating and pacifying emergent or critical alternatives (Said 1978). Whether those empowered by the present model will support, approve and implement the solutions proposed by PCOs remains an unknown but important aspect of catchment management in Canada, New Zealand, Scotland and the Scottish–English Borderlands.

PCOs are growing in number and influence in the developed world. Amongst the amorphous group labelled NGO, this subgroup is distinctive due to its

shared origins, objectives, approaches and challenges faced. Specifically, their aim of socio-economic-environmental sustainability; their position as trusted, central figures who mediate and reconcile competing interests and scales; their inclusiveness toward stakeholders; their approaches to funding and to multiplying investments from diverse sources; and their presumption that win–win scenarios are a prerequisite all help to explain their growing influence over catchment management. This in-depth engagement has allowed us to identify principles for other organisations interested in this ongoing reconceptualisation and reorganisation of developed world catchment management.

Acknowledgements

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References

Allen W, Fenemor A, Kilvington M, Harmsworth G, Young R G, Deans N, Horn C, Phillips C, De Oca O M, Ataria J and Smith R 2011 Building collaboration and learning in integrated catchment management: the importance of social process and multiple engagement approaches *New Zealand Journal of Marine and Freshwater Research* 45 525–39

Blackstock K L and Richards C 2007 Evaluating stakeholder involvement in river basin planning: a Scottish case study *Water Policy* 9 493–512

Cook B R and Spray C J 2012 Ecosystem services and integrated water resource management: different paths to the same end? *Journal of Environmental Management* 109 93–100

Cook H, Wem F C, Benson D, Inman A, Jordan A and Smith L 2012 Catchment management groups in England and Wales: extent, roles and influences *Water and Environment Journal* 26 47–55

Cooksley S L 2007 *River Dee Catchment Management Plan Action Pack* Dee Catchment Partnership, Aberdeen

Davies-Colley R J, Nagels J W, Smith R A, Young R G and Phillips C J 2004 Water quality impact of a dairy cow herd crossing a stream *New Zealand Journal of Marine and Freshwater Research* 38 569–76

Du Toit D and PollardS 2008 Updating public participation in IWRM: a proposal for a focused and structured engagement with Catchment Management Strategies *Water Sa* 34 707–13

Eden S, DonaldsonA and Walker G 2006 Green groups and grey areas: scientific boundary-work, nongovernmental organisations, and environmental knowledge *Environment and Planning A* 38 1061–76

Fenemor A D, Neilan D, Allen W and RussellS 2011a Improving water governance in New Zealand – stakeholder views of catchment management processes and plans *Policy Quarterly* 7

Fenemor A, Phillips C, Allen W, Young R G, Harmsworth G, Bowden B, Basher L, Gillespie P A, Kilvington M, Davies-Colley R, Dymond J, Cole A, Lauder G, Davie T, Smith R, Markham S, Deans N, Stuart B, Atkinson M and CollinsA 2011b Integrated catchment management-interweaving social process and science knowledge *New Zealand Journal of Marine and Freshwater Research* 45 313–31

Fish R D 2011 Environmental decision making and an ecosystems approach: Some challenges from the perspective of social science *Progress in Physical Geography* 35 671–80

FBC 2003 *Invasive plant strategy for British Columbia* Fraser Basin Council, Victoria

Gooch M 2005 Voices of the volunteers: an exploration of the experiences of catchment volunteers in coastal Queensland, Australia *Local Environment: The International Journal of Justice and Sustainability* 105–19

Harvey D 2010 *The enigma of capital and the crises of capitalism* Profile Books, London

Irwin A 1995 *Citizen science: a study of people, expertise and sustainable development* Routledge, London

IrwinA 2006 The politics of talk: coming to terms with the 'new' scientific governance *Social Studies of Science* 36 299–320

IrwinA and Michael M 2003 *Science, social theory and public knowledge* Open University Press/McGraw-Hill, Maindenhead

Jackson A, Illsley B and LynchW 2012 Fishing from the same pool: the influence of environmental governance on local climate change actions on Scotland and the US Pacific Northwest *Journal of Environmental Assessment Policy and Management* 14 1–25

JepsonP 2005 Governance and accountability of environmental NGOs *Environmental Science & Policy* 8 515–24

Johnson C L and Priest S J 2008 Flood risk management in England: a changing landscape of risk responsibility? *International Journal of Water Resources Development* 24 513–25

KesbyM 2007 Spatialising participatory approaches: the contribution of geography to a mature debate *Environment and Planning A* 39 2813–31

Lane S N, Landstrom C and Whatmore S J 2011a Imagining flood futures: risk assessment and management in practice *Philosophical Transactions of the Royal Society A* 369 1784–806

Lane S N, Odoni N, Landstrom C, Whatmore S J, Ward N and BradleyS 2011b Doing flood risk science differently: an experiment in radical scientific method *Transactions of the Institute of British Geographers* 36 15–36

Marshall K, Blackstock K L and DunglinsonJ 2010 A contextual framework for understanding good practice in integrated catchment management *Journal of Environmental Planning and Management* 53 63–89

MillerC 2000 The dynamics of framing environmental values and policy: four models of societal processes *Environmental Values* 9 211–33

Mustafa D 2002 To each according to his power? Participation, access, and vulnerability in irrigation and flood management in Pakistan *Environment and Planning D-Society & Space* 20 737–52

OliverP 2001 What makes catchment management groups 'tick'? *Water Science and Technology* 43 263–72

Penning-Rowsell E C and Pardoe J 2012 Who loses if flood risk is reduced: should we be concerned? *Area* 44 152–9

Polasky S, Carpenter S R, Folke C and KeelerB 2011 Decision-making under great uncertainty: environmental management

in an era of global change *Trends in Ecology & Evolution* 26 398–404

Reed M S 2008 Stakeholder participation for environmental management: a literature review *Biological Conservation* 141 2417–31

Repetto R 1986 *World enough and time: successful strategies for resource management* Yale University Press, New Haven, CT

Said E W 1978 *Orientalism* Penguin Books, London

ShrubsoleD 2007 From structures to sustainability: a history of flood management strategies in Canada *International Journal of Emergency Management* 4 183–96

Tseng C and Penning-Rowsell E C 2012 Micro-political and related barriers to stakeholder engagement in flood risk management *The Geographical Journal* 178 253–69

Van Wyk E, Roux D J, Drackner M and Mccool S F 2008 The impact of scientific information on ecosystem management: Making sense of the contextual gap between information providers and decision makers *Environmental Management* 41 779–91

WerrittyA 2006 Sustainable flood management: oxymoron or new paradigm? *Area* 38 16–23

Whatmore S 2002 *Hybrid geographies: natures, cultures, spaces* Sage, Thousand Oaks, CA

Wynne B 1996 May the sheep safely graze? A reflexive view of the expert-lay knowledge divide *Risk, Environment & Modernity* Sage, London

Yearley S 1993 Standing in for nature: the practicalities of environmental organisations' use of science in **Milton K** ed *Environmentalism: the view from anthropology* Routledge, London

Yearley S 1996 Nature's advocates: putting science to work in environmental organisations in **Irwin A and B Wynne** eds *Misunderstanding science: the public reconstruction of science and technology* Cambridge University Press, Cambridge

Yin R K 2003 *Case study research : design and methods* Applied social research methods series 3rd ed Sage, Thousand Oaks, CA

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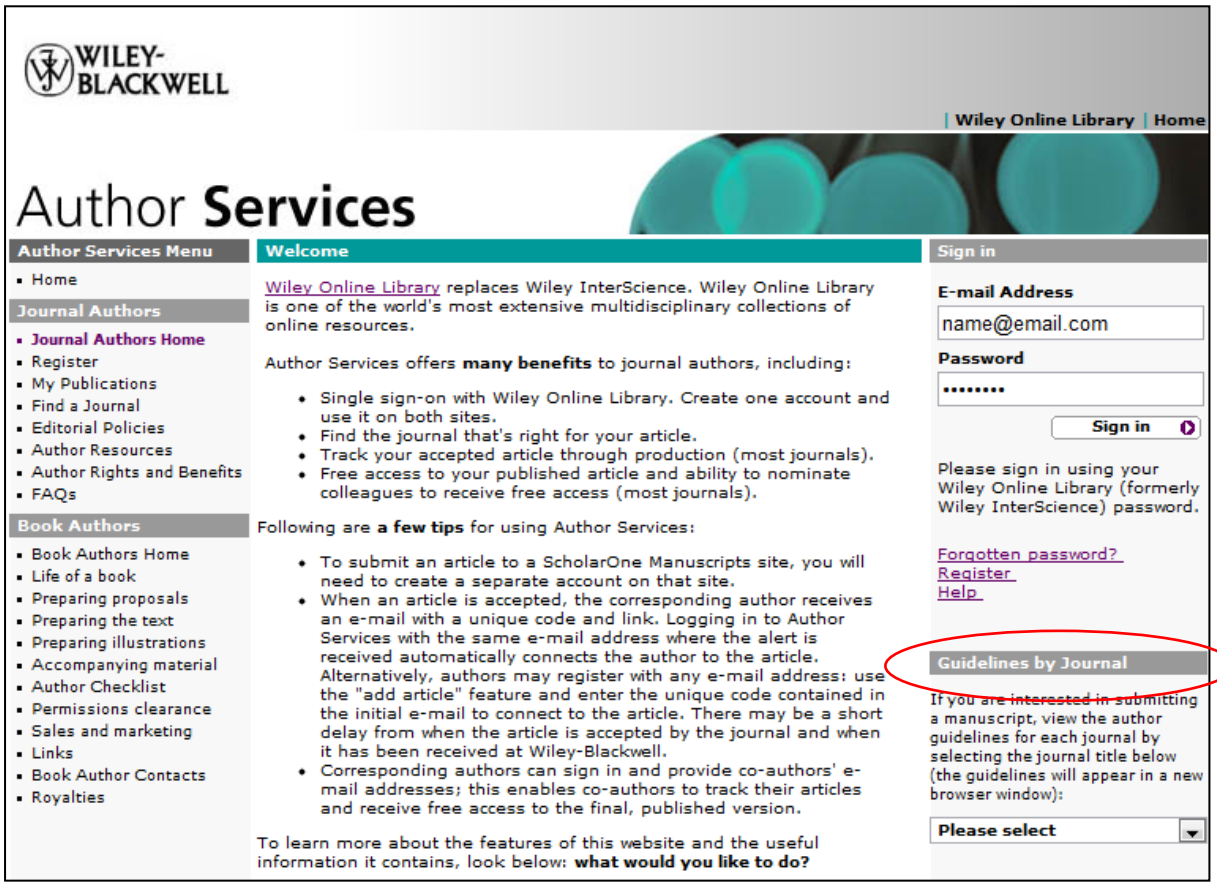

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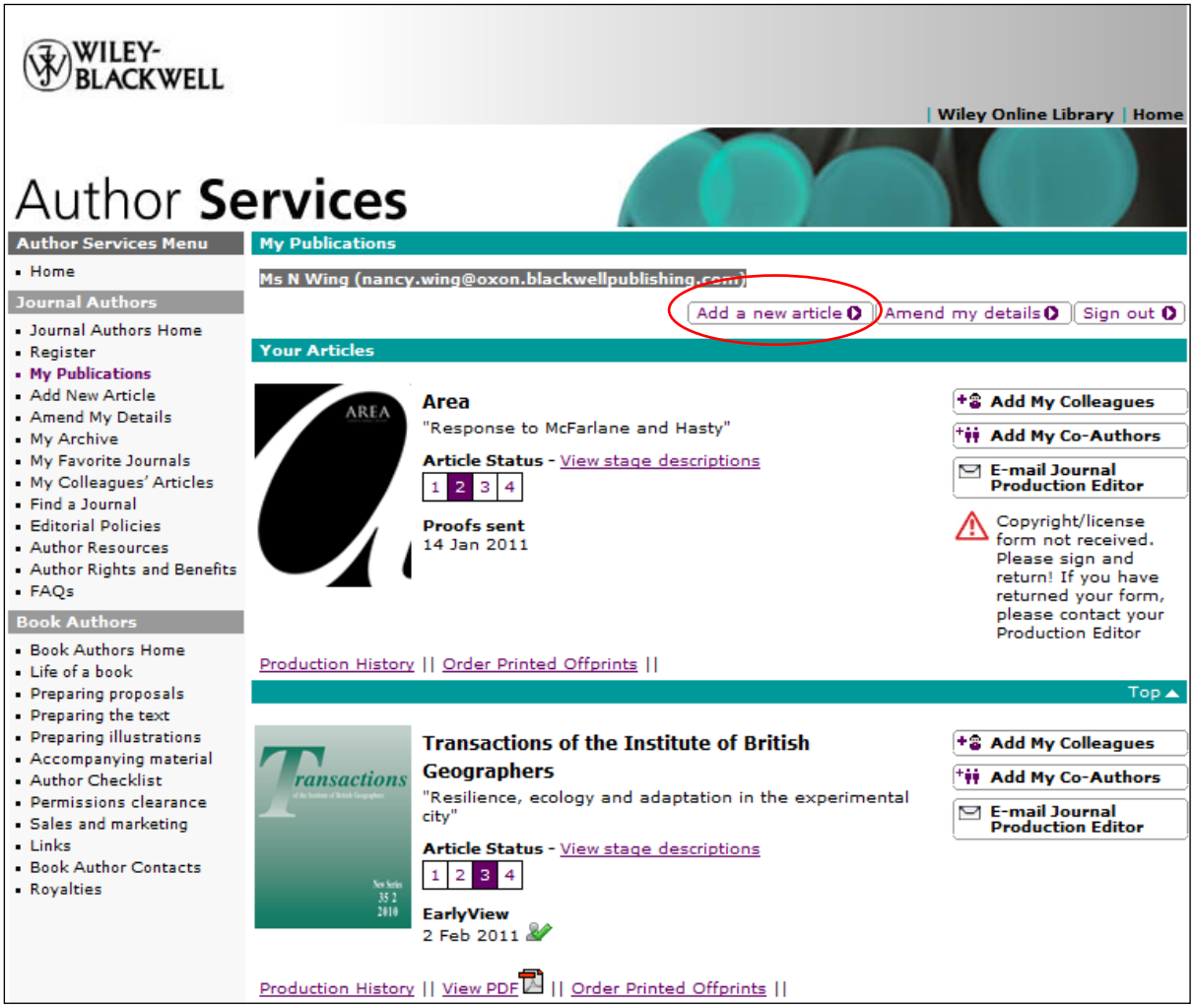

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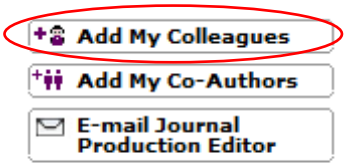

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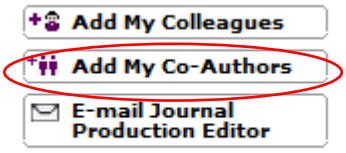

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